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FACSIMILE TRANSMITTER

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FACSIMILE TRANSMITTER

[Fakushimiri soshin sochi]

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[There are no amendments to this patent.]

Claims

1. A type of facsimile transmitter characterized by the following facts: the facsimile transmitter has a subscanning head that has a light source for illuminating the surface of the original for transmitting, a solid image sensor that scans and photoelectrically converts the light reflected from said original surface for transmitting, and an imaging lens for imaging the image of said original surface for transmitting on said solid image sensor; subscanning is performed by moving said subscanning head, and the image signal that has been photoelectrically converted is temporarily stored in a line memory, and it is then read and transmitted; in this facsimile transmitter, there is a means with the following function: said subscanning head starts subscanning from the starting point of the range to be subscanned; after the terminating end is

reached, the order for write/read of the image signal in said line memory is reversed, and said terminating end is now taken as the starting point of the next round of subscanning.

2. A type of facsimile transmitter characterized by the following facts: the facsimile transmitter has a subscanning head that has a light source for illuminating the surface of the original for transmitting, a solid image sensor that scans and photoelectrically converts the light reflected from said original surface for transmitting, and an imaging lens for imaging the image of said original surface for transmitting on said solid image sensor; subscanning is performed by moving said subscanning head; in this facsimile transmitter, there is a means with the following function: said subscanning head starts subscanning from the starting point of the range to be subscanned; after the terminating end is reached, the scanning direction in said solid image sensor is reversed, and said terminating end is now taken as the starting point of the next round of subscanning.

Detailed explanation of the invention

This invention pertains to a type of facsimile transmitter with a high reliability and high speed of operation.

Figure 1 is a diagram illustrating an example of the conventional constitution of a facsimile transmitter that performs subscanning by moving a subscanning head carrying an illuminating light source, a scanning photoelectric conversion unit, etc. while the original for transmitting remains in one location. In this figure, (1) represents the original for transmitting; (2) represents the subscanning head; Li represents the illuminating light source; M represents a mirror; Le represents an imaging lens; and S represents a solid image sensor. (3) represents a driving belt; (4), (5), (6), (7), (8), (9), (10), (11) represent pulleys; (12) represents a motor for returning; (13) represents a motor for subscanning; (14), (15) represent transmitting belts.

In this example of constitution, original (1) for transmitting is illuminated from lower side with illustrating light source Li carried on subscanning head (2). The light reflected from original (1) for transmitting is used for scanning photoelectric conversion by solid image sensor S after mirror M and imaging lens Le. Subscanning head (2) performs subscanning while moving in the direction indicated by solid line arrow in the figure by means of subscanning motor (13) via driving belt (3), pulleys (4)-(7), (10), (11), and transmitting belt (15). After completion of the subscanning of subscanning head (2) in the prescribed subscanning range, the subscanning head is returned in the direction indicated by the broken line arrow in the figure to the subscanning start position by means of returning motor (12) via driving belt (3), pulleys (4)-(9), and transmitting belt (14).

In the aforementioned constitution, in order to return subscanning head (2), it is necessary to have dedicated returning motor (12), transmitting belt (14) and pulleys (8), (9). In addition, in

order to perform switching of subscanning motor (13) and returning motor (12), a clutch may be needed, and the device cannot be made to have a small size. Also, for original (1) for transmitting, a return time is needed after each page. Especially in the case of continuous transmitting, such a return time cannot be ignored, and it is difficult to perform the operation at a high speed. This is undesirable.

The purpose of this invention is to solve the aforementioned problems of the prior art by providing a type of facsimile transmitter characterized by the fact that the subscanning direction is reversed after each original (1) for transmitting, there is no need to return the subscanning head, so that the facsimile transmitter has a smaller size and a higher speed of operation. In the following, this invention will be explained in more detail with reference to the figures.

Figure 2 is a diagram illustrating the constitution of an application example of this invention. (21) represents an original for transmitting; (22) represents the same type of subscanning head as that in Figure 1; (23) represents a driving belt; (24), (26), (27), (28), (29) represent pulleys; (30) represents a transmitting belt; (31) represents a subscanning motor; (32), (33) represent subscanning terminating end sensor.

In the following, the operation will be explained. Original (21) for transmitting is illuminated from the lower side with illustrating light source Li carried on subscanning head (22). The light reflected from original (21) for transmitting is used for scanning photoelectric conversion by solid image sensor S after mirror M and imaging lens Le. Subscanning head (22) first performs subscanning while moving in the direction indicated by the solid line arrow in Figure 2 by means of driving belt (23), pulleys (24)-(29), and transmitting belt (30). Then, when subscanning head (22) reaches subscanning terminating end detecting sensor (33), the mode is switched to have subscanning head (22) move in the direction indicated by the broken line arrow in Figure 2, and the device stands-by for setting the next page of the original for transmitting. After the next page of the original for transmitting is set, subscanning head (22) is driven to move in the direction indicated by the broken line arrow in Figure 2 while performing scanning photoelectric conversion. Then, when subscanning terminating end sensor (32) is reached, it stops. After subscanning head (22) reaches subscanning terminating end sensor (32), the mode is switched to have subscanning head (22) move in the direction indicated by the solid line in Figure 2, and it stands-by for setting of the next page of the original for transmitting. Also, if the positions of subscanning terminating end sensors (32), (33) can be adjusted, one can fax only a portion of the original for transmitting. In this way, the subscanning direction is reversed each time when the next page of the original for transmitting is set. However, in the aforementioned application example, when the subscanning direction is reversed, if the scanning direction of solid image sensor S is not reversed at the same time, the output order of the image signal is reversed, and the obtained picture is an inverted copy. However, usually, solid image sensor S

has a constant scanning direction, and it is necessary to process the image signal output of solid image sensor S so as to reverse the output order of the image signal.

Figure 3 is a block diagram illustrating the circuit constitution when line memories are used to reverse the output order of the image signal. In this figure, (34) represents a solid image sensor of the same type as S in Figure 2. (35) represents an image signal amplifier; (36) represents a binary circuit; (37), (38) represent line memories; and (39) represents a memory control unit.

The operation will be explained below. First of all, as shown in Figure 2, in the case of subscanning in the direction indicated by the solid line arrow, the direction is taken as matched with the scanning direction of solid image sensor (34). In this case, the output of solid image sensor (34) is amplified with image signal amplifier (35), and the signal is converted into a binary signal and has its waveform shaped with binary circuit (36). It is then written in one of line memories (37), (38) in the order from address 1 to addresses 2, 3, 4.... and address n. Then, while write is performed for line memory (37), addresses 1, 2, 3... n are read sequentially from line memory (38). Or, when write is performed for line memory (38), said addresses are read sequentially from line memory (37). Then, as shown in Figure 2, when subscanning head (22) reaches subscanning terminating end sensor (33), the mode is set such that the output signal of subscanning terminating end sensor (33) is input to memory control unit (39), and the read order of the line memories is reversed. As subscanning head (22) starts subscanning in the direction indicated by the broken line arrow, the output of solid image sensor (34) is amplified with image signal amplifier (35), followed by conversion into a binary signal and waveform shaping by means of binary circuit (36). The signal is then written in one of line memories (37), (38) in the order of addresses 1, 2, 3... n. Then, while write is performed for line memory (37), the signal is read from line memory (38) in the order of addresses n, (n-1)... 2, 1. On the other hand, when write is performed for line memory (38), said read operation is performed from line memory (37). Then, when the subscanning comes to an end in the direction indicated by the broken line arrow as shown in Figure 2, as subscanning head (22) reaches subscanning terminating end sensor (32), the output signal of subscanning terminating end sensor (32) is input to memory control unit (39), and it is set in a mode in which the read order of line memories (37), (38) is reversed.

Figure 4 is a diagram illustrating another application example of this invention. While line memories (37), (38) are used to reverse the output order of the image signal in the application example shown in Figure 3, in the application example shown in Figure 4, the scanning direction of solid image sensor (34) itself is reversed.

That is, solid image sensor (34) is composed of light receiving elements corresponding to the various pixels, respectively. As it is sequentially scanned with driving circuit (34'), output is

obtained. The constitution is such that the scanning direction of driving circuit (34') is switched with the output of subscanning terminating end sensors (32), (33). In this case, driving circuit (34') is controlled by the output (solid line) of subscanning terminating end sensor (32) and the scanning direction of solid image sensor (34) is taken as the normal scanning direction. Also, driving circuit (34') is controlled by the output (broken line) of subscanning terminating end sensor (33), and the scanning direction of solid image sensor (34) is reversed from that up to this point.

In this way, it is possible to perform continuous transmitting without waste in the same way as in Figure 3.

As explained above, according to this invention, each time when a page of original for transmitting is set, the subscanning direction is reversed, and the order for write/read of the line memory is reversed. Consequently, there is no need to have return mechanism for the subscanning head, and there is no return time. Consequently, the device has a smaller size, a higher reliability, and a higher FAX speed. Also, as the scanning direction of the solid image sensor can be switched at the terminating end of subscanning so that the terminating end becomes the starting point of the next round of subscanning, it is possible to perform reversion by means of the driving circuit of the solid image sensor, while the line memory is left as is.

Brief description of the figures

Figure 1 is a diagram illustrating the constitution of a conventional facsimile transmitter. Figure 2 is a diagram illustrating the constitution of the facsimile transmitter in an application example of this invention. Figure 3 is a block diagram illustrating the circuit constitution when the sequential of output of the image signal is reversed by means of line memories. Figure 4 is a block diagram schematically illustrating another application example of this invention.

21	Original for transmitting
22	Subscanning head
23	Driving belt
24-29	Pulley
30	Transmitting belt
31	Subscanning motor
32, 33	Subscanning terminating end sensor
34	Solid image sensor
34'	Driving circuit
35	Image signal amplifier
36	Binary circuit

37, 38	Line memory
39	Memory control unit

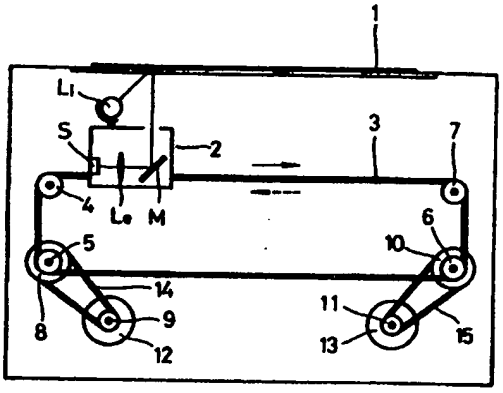

Figure 1

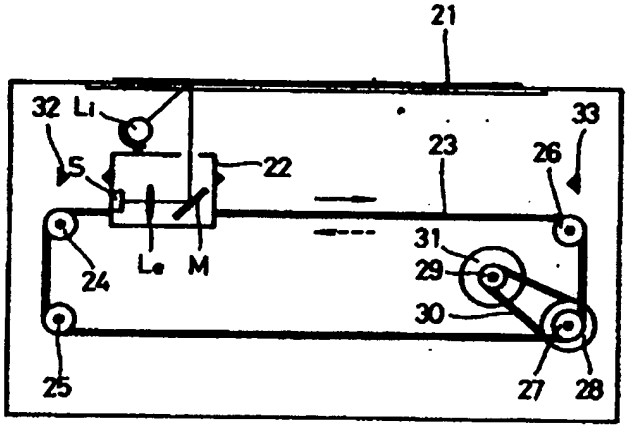

Figure 2

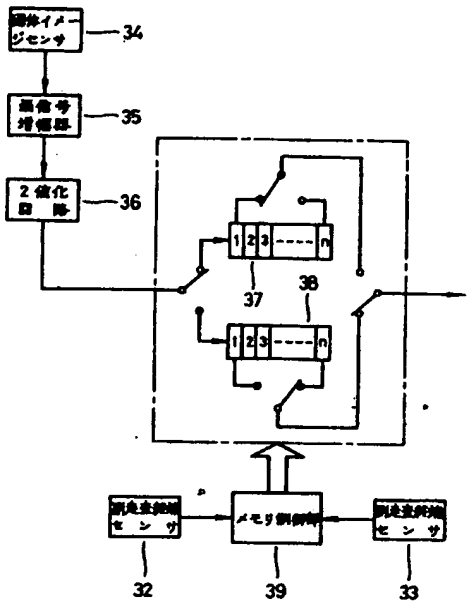

Figure 3

Key: 32 Subscanning terminating end sensor
34 Solid image sensor
35 Image signal amplifier
36 Binary circuit
39 Memory control unit

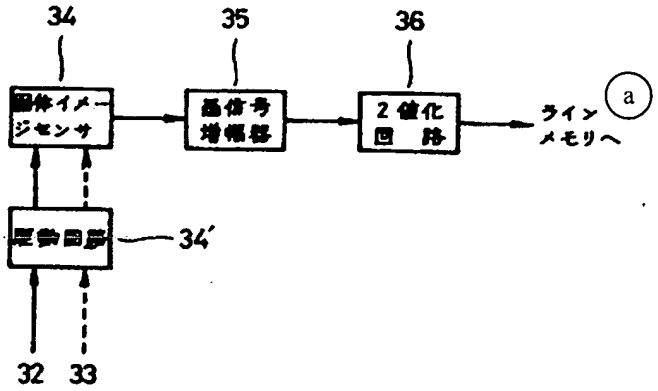

Figure 4

Key: a To line memory
34 Solid image sensor
34' Driving circuit
35 Image signal amplifier
36 Binary circuit